Apex Locators

U.S. Army Endodontic Short Course 2004
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I. Development of the apex locator:

a. 1918- Custer observes that there is a change in electrical conductivity between the root canal and the periradicular tissues.
b. 1942- Suzuki observes a constant resistance between the PDL and oral mucosa regardless of the patient or tooth.
c. 1962- Sunada measures the electric resistance between PDL and the oral mucosa to be 6500 ohms.

II. Three types of apex locators:

a. Resistance
b. Impedance
c. Frequency

III. Apical anatomy:

a. Anatomic apex- The tip or end of the root as determined morphologically.
b. Radiographic apex- The tip or end of the root as determined radiographically, its location can vary from the anatomic apex due to root morphology and distortion of the radiographic apex.
c. Cementodentinal junction (CDJ)- The region at which the dentin and cementum are united; commonly use to denote the point at which the cemental surface terminates at or near the apex of a tooth; position can range from 0.5 mm to 3.0 mm from the anatomic apex.
d. Apical constriction (minor diameter)- The apical portion of the root canal having the narrowest diameter; position may vary but is usually 0.5 mm-1.0 mm short of the center of the apical foreman.
f. Apical foramen- The main apical opening of the root canal.

IV. The apical foramen:

a. Green (1955)- The major apical foramina are situated directly at the apices more frequently in the maxillary anteriors and 1st premolars and mandibular 2nd premolars.
b. Burch and Hulen (1962)- The average distance from the anatomic apex to the most occlusal point of the apical foramen is 0.59mm.
c. Kuttler (1955)- The distance between the apical constriction and the apical foramen averages 0.507 mm in younger and 0.784 mm in older individuals.

V. Accuracy of apex locators:

a. Shabahang et al. (1996)- Root XZ was accurate to within 0.5mm of the apical foramen 96.2% of the time for vital teeth.

b. Pagavino et al. (1998)- Root ZX was accurate to within 0.5mm of the apical foramen 82.75% of the time.

VI. Conduction media (irrigant)

a. Sodium hypochlorite
b. RC Prep
c. Local anesthetic
d. Saline

VI. Trouble shooting:

a. Meter display does not advance
    1. Calcified canal
    2. Canal obstruction
    3. Dry canal
    4. Root form restricts navigation
    5. Apex surrounded by pustule

b. Meter overreacts as file enters the canal
    1. Large foramen
    2. Pulp chamber wet
    3. Perforation
    4. Small file
    5. Pulp in chamber
    6. File touching metal restoration
    7. Leaking restoration

VII. Testing you unit:

a. Place file holder and lip clip 1 cm apart on your moistened finger. This should give a consistent reading.

VIII. Specific Products

a. Root ZX (J. Morita Co., Kyoto, Japan) $929

b. Bingo 1020 (DentCorp, White Plains, NY USA) $794

c. Elements Apex Locator (SybronEndo, Orange, CA, USA) $895